THE AMERICAN MINERALOGIST

JOURNAL OF THE MINERALOGICAL SOCIETY OF AMERICA

VOL. 6 AUGUST, 1921 No. 8

APHTHITALITE FROM KILAUEA[1]

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The mineral aphthitalite, a non-hydrated sulfate of potassium and sodium, is one of the rarer of the natural soluble sulfates. It has been reported at Vesuvius,[2] where it is rather common and was first discovered in 1795, at Racalmuto in Sicily,[3] at Douglashall near Stassfurt,[4] and more recently at Searle's Lake, in California,[5] and at Etna.[6] Ponte thinks that it probably occurs also at Stromboli. The composition is undoubtedly variable, but has been commonly (Dana, Groth, etc.) regarded as $(K, Na)_2SO_4$, with $K_2O : Na_2O = 3 : 1$.

The mineral described in the present paper was obtained by one of us, in September, 1920, from a crevice in a solidified, but still hot, flow of basalt of the eruption of Kilauea, (Hawaiian Islands), which began in December, 1919, at a spot now called Mauna Iki, in the Kau Desert, about 8 kilometers (5 miles) southwest of Halemaumau.[7] The aphthitalite coated some of the hotter portions of the walls of a crack in the roof of what was apparently a collapsed lava tunnel. The spot was visited by Dr. Jaggar and Prof. A. L. Dean on 18 July, 1920, when they found the crack incandescent below, "indicating a temperature not less than 800° C." On the walls of this were "salts subliming from a vaporized condition. These salts appeared bright yellow below, green in an intermediate zone, and blue on the cooler edges. When collected with a stick the salts instantly changed completely to an azure blue color." These salts gave with ammonia a strong reaction for copper, and were considered to be copper sulfate, but the specimens collected by Jaggar and Dean have not as yet been thoroly investigated.[1]

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[1] Presented at the meeting of the Mineralogical Society of America, December 29, 1920.

[2] Cf. Zambonini, *Mineralogia Vesuviana*, p. 316, 1910.

[3] Vom Rath and Scacchi, *Neues Jahrb. Min. Geol.*, **1875**, 620.

[4] H. Bücking, *Z. Kryst. Min.*, **15**, 561, 1889. Bücking adopts Hausmann's name, *glaserite*, (1847), which is now commonly used in Germany, altho he admits the priority of Beudant's aphthalose (1832) and Shepard's aphthitalite (1835).

[5] W. F. Foshag, *Am. J. Sci.*, [4], **49**, 367, 1920.

[6] G. Ponte, *Atti Accad. Lincei*, [5], **28**, 362, 1920. The occurrence of aphthitalite at Etna was noted by von Waltershausen, Der Etna, II, p. 527, 1880.

[7] T. A. Jaggar, *Bull. Haw. Volc. Observ.*, **7**, 185, 1919.

When the specimens studied by us were collected no incandescence was visible, altho the crack was still very hot—so much so that the unprotected hand could not be placed in it for more than a few seconds. At cooler places in the crack, some meters from the aphthitalite, the crust consisted chiefly of thenardite, colored slightly blue by copper.

The aphthitalite forms small, hexagonal tables, rather poorly developed, from 2 to 5 mm. in diameter, and a millimeter or less in thickness. They are rather firmly adherent to the lava by a thin layer of what appears to be the same material. The tables are of a dull white color, with a very slightly bluish tinge; this, however, is not so pronounced as when the mineral was first collected. The tables are coated and are intergrown, to the extent of about 5 per cent., with an apparently colorless, unidentifiable salt ($\alpha = 1.55$, $\gamma = 1.585$). The aphthitalite is uniaxial. Its optical properties are given in the table below, together with those of related minerals.

TABLE I. OPTICAL PROPERTIES OF APHTHITALITES

	$K_2O : Na_2O$	α	β	γ	
Arcanite	(K_2SO_4)	1.493	1.494	1.497	Artificial
Aphthitalite	ca. 3 : 1	1.490		1.496	Searle's Lake
Aphthitalite	ca. 1 : 1.5	1.487		1.492	Kilauea
Thenardite	(Na_2SO_4)	1.471	1.477	1.484	Artificial

The optical similarities are notable; but even more noteworthy are the crystallographic similarities between arcanite (orthorhombic) and aphthitalite (rhombohedral). The positions of the simple forms (001), (111), (021), (110), (100), and (010) of arcanite coincide, within ± 5′, with the base, unit rhombohedron, and prism, of certain aphthitalites; furthermore the positive acute bisectrix of arcanite corresponds to the positive optic axis of aphthitalite.[1] The reported inversions of potassium sulfate[2] and sodium sulfate[3] at about 600° and 200° respectively to uniaxial (probably hexagonal) forms are of interest in this connection. It would appear to be probable that both salts are isodimorphous, the hexagonal form being that of the higher temperature.

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[1] Jaggar, *Bull. Haw. Volc. Observ.*, **8**, 84 and fig. 2, 1920.

An analysis (by H. S. W.) gave the following results: SO_3 51.50, Cl 0.03, K_2O 23.72, Na_2O 22.76, CaO 0.39, MgO none, CuO 0.46, H_2O 0.25, insol. 0.76, sum 99.87%. The composition, calculated from these data, is given below, with analyses of the mineral from other localities. The references have been given above.

TABLE II. ANALYSES OF APHTHITALITE.

	Kilauea	Searle's Lake	Douglas-hall	Etna	Vesuvius	Vesuvius
K_2SO_4	43.88	72.37	66.5	38.3	70.39	50.35
Na_2SO_4	52.12	18.38	22.0	58.9	26.91	43.97
$CaSO_4$	0.95	....	....	none	1.46	4.23
$CuSO_4$	0.94	....	....	2.8	....	....
$PbSO_4$	none	....	....	....	....	1.25
NaCl	trace	7.87	10.1	....	....	....
SO_3 (excess)	0.94	....	....	trace	....	....
Cl	0.03	....	....	trace	....	....
H_2O	0.25	0.10	1.0	....	....	....
Insoluble	0.76	....	0.4	....	0.81	....
	99.87	100.04	100.0	100.0	99.57	99.80

In the Kilauea aphthitalite no trace of lead could be detected, altho this seems to be usually present in that from Vesuvius. Palmierite, a hexagonal sulfate of lead and potassium, was found by Lacroix in crevices of the lava of 1906, and has been more recently investigated by Zambonini,[4] who shows that it is apparently isomorphous with aphthitalite. The occurrence of lead in the aphthitalite of the highly potassic lavas of Vesuvius, while it is not present in the sodi-calcic ones of Etna and Kilauea, is a point to be noted.

The insoluble matter in the Kilauea salt was mostly (0.51) volcanic ash or fragments of scoria, with a smaller amount (0.25) of what appeared to be a yellow basic ferric sulfate. It was impossible to free the material for analysis from the slight amount of admixed salt with a higher refractive index, noted above. After allowing for such physical impurities in this and other analyses, the composition of aphthitalite is obviously quite variable. Indeed, some of the Vesuvius specimens analyzed by Casoria seem to be acid sulfates, at least in part, and, as pointed out by Zambonini, can scarcely be considered to be aphthitalite.[1]

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[1] Zambonini (*op. cit.*, p. 318) observed a slight biaxiality in some Vesuvian aphthitalites.

[2] Groth, *Chem. Kryst.*, II, p. 3221, 1908.

[3] Cf. Mügge, *Neues Jahrb. Min. Geol.*, **1884**, II, 3.

[4] Zambonini, *Mineralogia Vesuviana*, p. 323.

In view of this variability in composition, the question arises as to the constitution of aphthitalite—whether it is a mixture or solid solution of the two sulfates, or whether it represents, as is commonly supposed (Bücking, Groth, etc.), a double salt, $3K_2SO_4 . Na_2SO_4$. Van't Hoff[2] found that sodium and potassium sulfates, under certain conditions, at a temperature of about 60°, form solid solutions, in which the proportion of potassium sulfate varies from about 62 to 77 per cent. Some of the occurrences of aphthitalite, such as those from Searle's Lake and Douglashall, and some from Vesuvius, correspond to these solid solutions; altho those from Vesuvius were undoubtedly formed at much higher temperatures. On the other hand, the analysis by Ponte of the Etna mineral, and that of the Kilauea specimen, show a sodium content that is considerably greater than that found by Van't Hoff at 60°, and thus raise the question as to the character of these solid solutions at higher temperatures. The chemical character of the lavas from which they are derived, a matter mentioned above, is also a factor to be taken into consideration.

The crystallographic and optical properties of the more highly potassic members of the series are known, but the more sodic members need further study. Jaeger[3] found that the rhombohedral angle increased with the sodium content; and the refractive indices of the highly sodic Hawaiian crystals are the lowest yet observed.

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[1] Casoria, (cited by Zambonini), determined copper in several specimens; and in one he found small amounts of Mg, Mn, Cu, Zn, Mo, Co, and Bi. The actuality of the presence of the last four may, possibly, be regarded as doubtful.

[2] Van't Hoff and Barschall, *Sitzb. preuss. Akad. Wiss.*, **1903**, 359–371.

[3] In Van't Hoff and Barschall, *op. cit.*

A word may be said in regard to the copper content of the Kilauea aphthitalite. The decidedly bluish color that the salt showed when first collected has gradually faded out, until now (January, 1921) it is almost colorless. Heating to about 300° partly restores the color, which fades again in a few days. The presence of acid sulfates may partly control these color changes. Anhydrous copper sulfate fuses with aphthitalite mixtures of varying composition to form mix-crystals[1] varying in color according to the proportions of potash and soda, as well as the amount of copper. The colors have remained permanent for some weeks.

Anhydrous copper sulfate, crystallized from hot sulfuric acid, forms thick, lozenge-shaped or hexagonal tables, with bounding angles of sensibly 60°. Optically the symmetry is orthorhombic, altho the optical characteristics are not entirely clear because of an hour-glass twinning structure seen thru the edges of some grains: $\beta = 1.72$, and $\gamma - \alpha = 0.02$. A close crystallographic relationship to aphthitalite and the alkali sulfates is thus indicated.

The reference books (Abegg and Gmelin-Kraut) state that anhydrous copper sulfate is colorless or slightly bluish gray. The grayish white color of the pulverulent salt produced by heating the pentahydrate is much deepened by wetting with a liquid of similar refractive index; so that crystals of megascopic size must be distinctly colored, probably dull greenish blue.

As to the mode of formation of aphthitalite, Ponte suggests that, at Etna, alkali chlorides were first formed, and that these were changed to sulfates when the fumarole temperature had decreased to about 500°, and sulfur trioxide had begun to be evolved. At Kilauea, on the other hand, hydrochloric acid and chlorides are present in but very small amount, while SO_2 and SO_3, as well as S, are abundant.[2] It may therefore be suggested that, at Kilauea (and possibly also at Etna) the alkalies and copper were volatilized as sulfides, in the gases escaping from the lava, and that the sulfates were formed and deposited where these gases were oxidized by contact with the air.

[1] Copper sulfate increases the refractive indices to at least $\alpha = 1.505$, $\beta = 1.545$, $\gamma = 1.580$, for crystals that are deep green or bluish green, and which contain about 30 per cent of copper sulfate.

[2] Day and Shepherd, *Bull. Geol. Soc. Am.*, **24**, 588, 1913; Shepherd, *Bull. Haw. Volc. Observ.*, **7**, 94, 1919.

THE OLD TUNGSTEN MINE IN TRUMBULL, CONNECTICUT

EARL V. SHANNON

U. S. National Museum

The old tungsten mine in Trumbull is a locality well known to collectors, especially by reason of the fine large pseudomorphs of wolframite after scheelite which have at times been found there. These are no longer obtainable, but there are numerous other interesting minerals to be found at this locality.

The mine can best be reached by walking north along the railroad from Long Hill station a distance of 1½ kilometer (a little less than a mile). The mine openings and ruins of the mill and equipment are conspicuously visible from the railroad. A train stopping at Long Hill leaves Bridgeport about 9 A.M. The distance is 15 km. (9 miles). Contrary to some published statements, I could find no trolley within reasonable distance of the mine. The mineralogist visiting Long Hill should supply himself in advance with a copy of Hobbs' article on the deposit, which is still obtainable.[1] This contains an excellent large scale map of the locality with all openings, trenches, etc., marked. Points in the following description will be referred to this map.

The tungsten minerals are reported to have occurred along the lower contact of a thick bed of coarsely crystalline white marble which is interbedded with a deep green amphibolite schist. Little can at present be learned regarding the occurrence of the ore, as neither scheelite nor wolframite is now visible in the workings. Some specimens supposed when collected to be wolframite proved upon examination to be a peculiar, very black, sphalerite. The lower opening of the mine is a large quarry-like affair immediately behind the site of the mill, which has been destroyed by fire. The face of the quarry is mostly thin bedded crystalline white marble containing bands rich in green hornblende and the granular pale-green pyroxene known as coccolite. Large nodules and lenses of granular-massive deep red garnet occur. Where these lenses of garnet have been exposed to the weather long enough for the surrounding calcite to be removed they show brilliant little brownish-red dodecahedral crystals.

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[1] Hobbs, W. H. The old tungsten mine in Trumbull, Conn. *U. S. Geol. Survey, Ann. Rept.*, **22**, 7–22.

The portion of the quarry showing the lower contact of the limestone is filled with water for the most part, but the contact is well exposed at the north end of the pit. Here there apparently is, at the base of the marble bed, a band rich in marcasite, both massive and in fibrous crusts up to 2 cm. in thickness. Small vertical quartz veins up to 3 decimeters (1 foot) in width cut this bed from below and split up and die out on entering the limestone. These veins contain, besides coarsely crystalline vitreous quartz, the black sphalerite mentioned above in cleavable masses up to 5 cm. in diameter, massive greenish to brownish yellow greasy topaz, and foliated and fibrous mica, all of which is probably margarodite. Tungsten minerals were not seen in the exposed portions of these veins but one might expect wolframite and scheelite in this association and these veins probably represent the same period of mineralization as the tungsten ores. In the bottom of the quarry pit at least one dike of normal pegmatite is exposed. This pegmatite is largely composed of quartz and biotite with some feldspar and does not contain any unusual minerals. Some narrow veinlets of a blackish green scaly chlorite occur along joints in the limestone and some of these were collected in the hope that they might prove to be the cronstedtite which has been reported from here.[1] These specimens all seem however to be prochlorite and such free crystals as occur have the curved vermicular form common to several chlorites, rather than the peculiar triangular form of cronstedtite. Large blocks of a rock consisting of quartz and acicular black tourmaline occur in the dump but these were not seen in place.

Around the road which is shown on Hobbs' map are several openings which may be found without difficulty. The tunnel shown on this map has produced nothing of interest. The old pit alongside the lime kiln is opened in laminated impure marble, like that in the main pit, containing lenses of granular red garnet, bands of coccolite pyroxene and in places small copper-red flakes of phlogopite. Some of the marble here is distinctly pink and some blocks are gray and porphyritic-appearing, from the development of larger crystals of calcite in a finer granular groundmass.

[1] Hoadley, Charles W., An American Occurrence of Cronstedtite, *Am. Min.*, 3. (1), 6, 1918.

Just beyond the lime kiln and below the road is an old trench which proved to be of absorbing interest. This trench was driven for some 20 meters on a vein somewhat less than 1 meter in width. Much of the material which occurs in the dump at the lower end of the trench appears at first glance to be a quartz-muscovite-feldspar pegmatite, but on closer inspection the main bulk of the material is seen to be coarse greasy gray to yellowish massive topaz, and the mica is the silvery foliated "hydromica" known as margarodite. Margarodite is characteristically an alteration product of topaz, and here the fluorine of the topaz has gone to form fluorite which is not uncommon in granular masses or imbedded grains ranging from deep purple thru various shades of pink and salmon to amber in color. The margarodite is mostly in radiate-foliate aggregates of a gray color but deep blue varieties occur. Some masses, very tough, compact fibrous and snowy white, have proved to be margarite. Specimens of the coarser margarodite associated with topaz usually have the topaz bounded by rough crystal planes next the mica.

In the other direction from the main pit along the line marked on the map "projected tramway" (the tramway was subsequently built and is now partly demolished) there are numerous test pits from which the debris consists of marble and rusty quartz with or without poor margarodite and topaz. The Champion Lode, a quartz vein opened by a short tunnel and mined up to the surface forms a dangerous hole and shows nothing of mineralogic interest. At the upper terminus of the tramway is the "Upper Mine." The main pit here is full of water and little is to be seen on the walls of the pit, which are mainly earthy and much weathered from the oxidation of iron minerals. One end of this wall has the crumpled appearance shown in the plate in Hobbs' report on the mine. In the piles of loose rock here were found masses of radiate-fibrous scapolite associated with flesh-colored fluorite, green hornblende and columnar masses of brownish-gray epidote.

PROCEEDINGS OF SOCIETIES

MINERALOGICAL SOCIETY OF AMERICA

The proceedings of the first annual meeting of the Society, which appeared in our February number, have also been published in *Bull. Geol. Soc. Am.*, **32**, 163–170, March 31, 1921. The Constitution and By-Laws are included. Copies can be obtained from Herbert P. Whitlock, Secretary.

NEW YORK MINERALOGICAL CLUB

Regular Monthly Meeting of Wednesday, March 16, 1921

The regular monthly meeting of the New York Mineralogical Club was held in the Academy Room of the American Museum of Natural History on the evening of March 16th, at 8.15 P.M. The President, Dr. George F. Kunz presided and there was an attendance of 72 members and visitors. The minutes of the last meeting were read and approved. Mr. O. I. Lee showed a specimen of lava from Mt. Erebus collected on the Shackleton Expedition, also a specimen of granite collected 415 miles from the South Pole (Beardmore Glacier).

Mr. Radu then spoke on "The Luminescence of Minerals." He explained the nature of the light waves used and the meaning of the expression $\mu\mu$ (millionth of a millimeter). He showed on the black board the wave-lengths of the principal rays used and explained the effect on certain minerals of vibrations produced by rays outside the spectrum. He then took up the subjects of fluorescence, phosphorescence and radioactivity, giving a short history of fluorescence and phosphorescence. The room being darkened, these effects were demonstrated in a very striking manner by means of apparatus which had been set up. Fluorescence produced by heat on pectolite was shown. Phosphorescence was produced in fluorite (chlorophane), willemite and troostite in calcite.

Dr. Kunz being called upon by the speaker showed a remarkable example of a phosphorescent diamond. Capt. Miller then exhibited these phenomena in thin sections of various minerals, by means of a specially equipped microscope which brought out many very striking effects.

A vote of thanks was tendered to Mr. Radu and to Capt. Miller.

HERBERT P. WHITLOCK, *Recording Secretary*

PHILADELPHIA MINERALOGICAL SOCIETY

Academy of Natural Sciences of Philadelphia, June 9, 1921

The June meeting of the Philadelphia Mineralogical Society was held on the above date, Dr. Hawkins presiding. Fourteen members and three visitors were present. Upon recommendation by the Council, Dr. L. C. Wills was elected to active membership.

Thru the courtesy of Dr. F. G. Kneer of New York, Dr. Hawkins was able to show a collection of 125 lantern slides of choice mineral specimens, which were extremely well colored, and strikingly realistic. Many groups in the Bement collection were included, those of calcite, quartz, malachite, azurite, tourmaline and fluorite being particularly noteworthy.

Mr. Biernbaum reported a three-day trip with Messrs. Frankenfield, Trudell, and Wills, to Falls of French Creek, the Birdsboro trap quarry, and Phoenixville, which resulted in turning up excellent chalcopyrite crystals at French Creek. Dr. Hawkins and Mr. Knabe reported sallies to Paterson, N. J., and O'Neills quarry, Pa., respectively, with negative results.

HARRY W. TRUDELL AND JOHN S. FRANKENFIELD, *Secretaries pro tem.*

The Deutsche Mineralogische Gesellschaft (German Mineralogical Society) held its seventh annual meeting (the first since 1913) on April 8–10 in Göttingen. About 20 papers were presented and several trips taken to mineral localities in the vicinity. The following officers were elected: President, R. Brauns (Bonn); Vice-presidents, A. Johnsen (Frankfurt), and O. Weigel (Marburg); Secretary, K. Spangenberg (Jena); Treasurer, Dr. Thost (of Gebr. Borntraeger, Berlin); Scientific Advisory Board, G. Aminoff (Lund, Sweden), F. Becke (Vienna), O. Mügge (Göttingen) and P. Niggli (Zurich Switzerland); Editor of the "Fortschritte," A. Johnsen. (*Centr. Min. Geol.* **1921**, (No. 11, June 1), 349–350.)

BOOK REVIEW

THE NOMENCLATURE OF PETROLOGY. Arthur Holmes. *New York:* D. Van Nostrand Co.; *London:* Thos. Murby & Co. 12mo, 284 pages. $3.50.

This book comprises a 22-page discussion of the principles of petrographic nomenclature, a 220-page glossary in which definitions and references are given for a large number of rock names and various other petrographic terms, lists of French and of German terms and of Greek and Latin words used as the roots of rock names, and tables of rock-classification.

The discussion of the principles which have been followed and those which ought to be followed in the development of new names is very good, and should be read by everyone engaged in scientific work where there is a temptation to improve or add to existing nomenclature. Many tho not all of the made-to-order names of recent years, as those of Jevons, of Shand, of Cross-Iddings-Pirsson-Washington, and of Grabau, are rejected by the author. The list of terms seems otherwise to be unusually complete, and to cover about every technical term likely to appear in petrographic writings. The definitions are in most cases satisfying, altho certain of those drawn from chemistry might be improved; for instance, it may be questioned whether the petrologist would gain an adequate conception of *adsorption* from the definition "A term applied to the change in concentration of solutions and colloids where they come into contact with surfaces." American literature has been apparently covered quite fully, and the up-to-date-ness of the work is evidenced by the inclusion, under the heading *system,* of some 15 articles from the Geophysical Laboratory of the Carnegie Institution of Washington. E. T. W.

NOTES AND NEWS

Corrections to list of Fellows—The name of E. Poitevin, included in the list of members of the Mineralogical Society of America in the February number (page 49) should be transferred to the list of Fellows, near top of page 47.

Mr. William F. Foshag has obtained leave of absence from the U. S. National Museum to accept a position as Assistant in Mineralogy in the University of California. His address in the list of fellows should accordingly be changed to: University of California, Berkeley, Cal.

On January 14, 1921, the Perkin Medal was awarded by the American Society of Chemical Industry to Dr. Willis R. Whitney, Director of the Research Laboratory of the General Electric Company at Schenectady, New York. Dr. Whitney is well known as one of the leaders in American chemistry, but it is not generally known that he gained his first interest in science as a result of the study of microscopic crystals. In his address, published in the *Journal of Industrial and Engineering Chemistry* (**13** (2), 162, February, 1921), he tells how it happened:

"When I was about 15 years old, an English mill owner and one of the leading citizens of my home town [Jamestown, N. Y.] Mr. William C. J. Hall, assisted in establishing a Young Men's Christian Association. He had also long been interested in the microscope, and was a scientist such as we seldom find among business men today. He formed a free evening class for about half a dozen boys—all that could work together around the rotating table on which he placed his immense microscope. This was so arranged that specimen, instrument, and illuminating system did not have to be disturbed as they passed from one boy to another for observation. He did not merely show his specimens, of which he had thousands, but taught us how to prepare them in all the various ways now more or less common. They were all wonderful to me, and still are. My mother gave me some money which, combined with that of one of the other boys, purchased a small microtome; and my father gave me $75 for a microscope. Under Mr. Hall's guidance I bought the instrument, with the understanding that whenever I wanted a better one, the old one would be taken back at the original price. I later procured one for $250 which, thruout 35 years, I have used almost daily. One of the first experiments I tried with the microscope was to precipitate metallic silver from silver nitrate solution onto a speck of copper filings. Anyone who has watched these beautiful crystals grow knows that they are surpassingly wonderful. They constituted my first chemistry. It was those little bottles of salts and bugs in alcohol that led someone to call me a chemist, and it apparently determined my future work. . . ."

We have received a letter from a Belgian student who would like to get into correspondence with American students, and also, being impoverished as a result of the war, would greatly appreciate receiving duplicate mineral specimens or publications on mineralogy and related sciences which anyone may be able to send him. Address: Léon Michel, 18 Rue de la Madeleine, Liége, Belgium.

T. Fukai's "Tennensha," of Konosu, Saitama, Japan, state in their catalog: "Rough precious stones wanted, especially semi-precious stones in rough condition, for cash or exchange. Best prices given, whenever we accepted samples." Correspondence and shipments should be addressed to: 28, Shichikencho, Shitaya, Tokyo, Japan.

The Colorado School of Mines has recently reopened the quarry on Table Mountain from which the famous zeolites formerly came. Quantities of good specimens are being obtained, which are offered in exchange to other institutions or to collectors.

NEW MINERALS

FAMILY 6. SILICATES

ORIENTITE

D. F. Hewett and E. V. Shannon: Orientite, a new hydrous silicate of manganese and calcium from Cuba. *Am. J. Sci.*, [5], 1, 491–506, 1921. [Presented at the meeting of the Mineralogical Society of America, Dec. 29, 1920.]

Name: From the locality, *Oriente* Province, Cuba.

Physical Properties

Color brown; luster resinous; streak hair brown; cleavage (110) imperfect, (001) poor; H. 4.5 – 5; sp. gr. 3.05.

Optical Properties

Optic plane parallel to c (001); orientation $X = a$, $Y = c$, $Z = b$; pleochroism marked, X red brown, Y yellow, Z brownish yellow; $2V = 67°$, $2E = 156°$ (calcd.); dispersion pronounced, $\rho < v$; $\alpha = 1.758$, $\beta = 1.776$, $\gamma = 1.795$.

Crystallographic Properties

Orthorhombic. $a : b : c = 0.6720 : 1 : 0.7916$; $p_0 = 1.1780$, $q_0 = 0.7916$. Habit tabular parallel to b, prismatic; forms b (010), c (001), m (110), e (102), y (011), z (112); dominant, b, c, m; rare, e, y, z.

Chemical Properties

Yields neutral water upon heating and turns dark brown. Sol. in HCl, with evolution of Cl and separation of flocculent silica. Fuses readily with intumescence to a black blebby mass. Analysis (average of 3): SiO_2 32.48, Al_2O_3 1.08, Fe_2O_3 1.56, MnO 29.92, O 3.27, CaO 22.47, MgO tr., H_2O – 0.03, H_2O + 7.93, sum 98.74%. This leads to the formula $4CaO.2Mn_2O_3.5SiO_2.4H_2O$. The mineral is thus one of the few silicates containing manganic manganese.

Occurrence

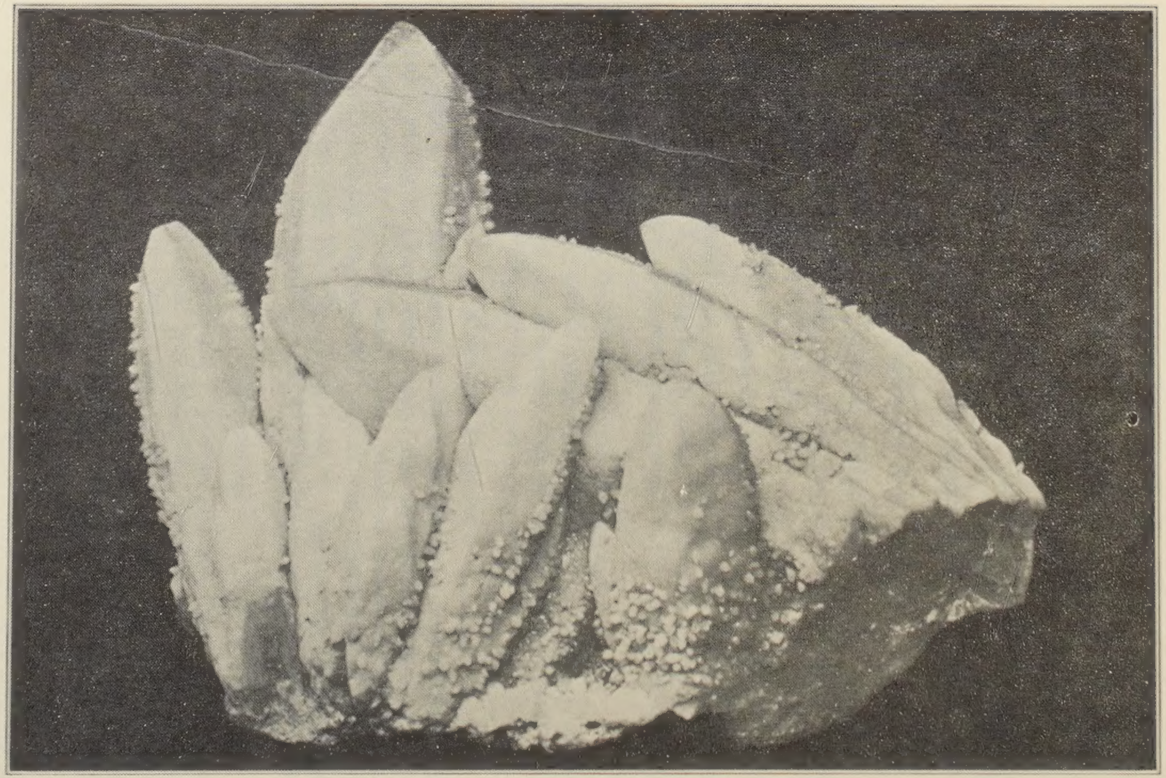
Occurs in the manganese ores of Oriente Province, Cuba, at a number of localities. It is associated with glauconite, psilomelane, manganite, barite, quartz, zeolites and calcite. Results from the action of hot manganese solutions upon volcanic tuffs. It is later than the glauconite, plumose manganite and psilomelane, but earlier than barite, prismatic manganite, quartz, zeolites and calcite.

Discussion

May belong to the kentrolite group, which it resembles crystallographically. It seems to differ from the minerals of the kentrolite group in ratio, but the ratios of these minerals are not very satisfactorily established [The mineral is definite and distinct, and can be classed as a well substantiated new species].

W. F. F.

PLATE 7



MILKY QUARTZ, NEAR OURAY, COLORADO. (× 1/3)
Florence P. Manchester Memorial Collection, Fall River, Mass.